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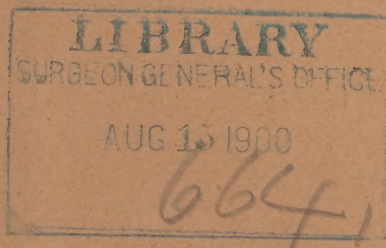
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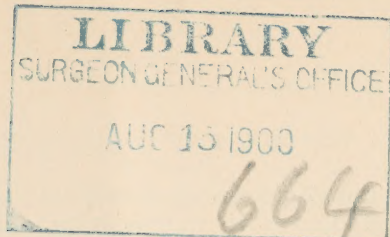
December 15, 1898.

Cases Illustrating the Value of the X-Ray in the Treatment of Fractures of Long Bones With Displacement.

By A. R. SHANDS, M. D.,
WASHINGTON, D. C.

Read before the Medical Society of the District of Columbia, November 16, 1898.





CASES ILLUSTRATING THE VALUE OF THE X-RAY IN THE TREATMENT OF FRACTURES OF LONG BONES WITH DISPLACEMENT.*

By A. R. SHANDS, M. D., Washington, D. C.

In reporting these cases of fractures of long bones in which the use of the X-ray has been of inestimable value in diagnosing the exact position of the broken bones, surely a few remarks on the modern treatment of such cases will not be out of place, although I fear some may accuse me of being a little dogmatic in my enthusiasm on this subject. If there be such, I trust they may think me somewhat justified in the remarks that are to follow by the results that have been obtained in these cases.

No subject in the wide range of surgery has received more attention than that of fractures of bones. From time immemorial surgeons the world over have given the subject great study; innumerable devices have been used by different surgeons, all with the same object in view—that of bringing about the best results. Many of these have long since been abandoned for the adoption of newer methods which in turn have likewise been dropped and others taken up. All of this goes to prove we have not yet found the method that will bring about perfect results in all cases. This has not been, however, to the detriment of the unfortunate individuals that have been the victims of such accidents, for after all the best method is the one that the surgeon knows best how to use. The number of deformities and cases of non-union that one sees as result of the treatment employed, as well as the great number of appliances that have been used, show how imperfectly the methods have answered the purpose. All surgeons, however skilful, have met with cases that have taxed their ability to the utmost, and, even after faithfully and conscientiously exercising all the skill at their command, have left living monuments to the glory of their failures.

* Read before the Medical Society of the District of Columbia November 16, 1898.

The first and most important point in these cases is a correct knowledge as to the position of the fragments of the broken bones, before attempting reduction. Thanks to modern science, we have in the X-ray the most valuable aid in diagnosing the true condition of affairs in these cases that has ever been discovered, and its aid should be invoked in every case where there is the least doubt as to the true position of the fragments of the broken bone.

Every hospital that proposes to do this kind of surgery should be equipped with this machine. It would be an excellent routine practice to have photographs of every fracture taken after reduction and application of the splints, to be sure that the fragments are in the best possible position for union. These X-ray photographs can be perfectly well taken for this purpose through the dressings.

Cases II. and III. [Plates III.-VIII.] here reported were photographed through a plaster-of-Paris case, after an attempt at reduction had been made and it was thought that a proper approximation of the fragments had been accomplished, when the condition of affairs as represented by the photographs was found to exist.

After a correct diagnosis as to the position of the broken bones has been made, the first and most important step in the treatment is to bring about the best possible approximation of the broken ends. Many conditions militate against this perfect approximation so much desired, such as a great separation of the ends; muscular action, which often makes it almost impossible to bring them together by manipulation and at the same time makes it impossible to hold the ends together, especially if the line of fracture is oblique. Interposition of soft tissues is another obstacle often encountered. All of this is more strongly emphasized by the numerous cases of non-union and union with deformity that we meet with than can be done by the words of any writer. Nothing can be more mortifying to a surgeon than a failure to get union, nor proclaim more loudly his lack of skill than to get union with deformity.

In these days of antiseptic surgery and almost perfect modern surgical technic, when the abdominal surgeon often enters the peritoneal cavity with impunity simply for the sake of exploration, why should one hesitate a moment to cut down on fractured bones to satisfy himself with absolute cer-

tainty as to the relative positions of the broken fragments? In other words, all simple fractures with displacements that cannot be easily reduced so as to obtain a perfect approximation, should be converted into compound fractures by means of the knife, under the best possible antiseptic precautions. In doing this nothing is added to the severity of the case, and often just the opposite is the result, for, by so doing, blood clot and effusion can be removed, which will put the surrounding tissues in a better condition to bring about repair to the injured parts. When the surgeon does this he has a perfectly clear field before him, he is then enabled to put the bones in the best possible position and fix them there by any means he may prefer, closing the wound for primary union. If this were done in all cases of fractures, both simple and compound, there would be fewer cases of non-union, and cases of union with deformity would be things of the past.

The writer does not mean to say that all cases of simple fractures should be so treated, for there are many fractures without displacement and many with slight displacement that can be easily reduced and held in apposition by simple means that will not require such radical procedure, but it is asserted that all cases that are difficult to reduce and those that have interposing tissues should be treated by open operation, and after approximating the broken ends they should be secured by some extraneous means, such as silver wire or kangaroo-tendon suture; better still, by leaving the drill in the bones. Later the drill can be easily removed after union has become sufficiently firm to prevent a recurrence of the displacement. When the line of fracture is oblique, the drill left in the bones projecting through the soft tissues is by far the most perfect means of fixing the bones in apposition. When the fracture is located near a joint, especially the elbow joint, which is beautifully illustrated by CASE III. it is impossible to keep the small pieces of bone in apposition with the longer bone without cutting down on the seat of fracture and securing it there.

CASE I. [Plates I. and II.] Age 13 years. Fell from a horse February 14, 1898, producing fracture at junction of upper with middle third of right femur. Position of fragments better shown by skiagraph No. 1 than can be done by any description. This case was referred to me by Dr. W. A. Gordon, of Orange county, Virginia, May 11th, about three

months after the accident. The photograph of the case was taken at the Lionel Laboratory, Emergency Hospital, the day that I first saw the case. No definite history of the treatment that the patient had received was obtained beyond the fact that several attempts at reduction had been made by the family physician and that he had been treated on an inclined plane at first, and later the limb had been put up in plaster of Paris.

Upon examination I found the general condition of the patient bad, the result of three months' confinement in bed. There was marked atrophy of right limb which rotated outward to 45° . Voluntary motion *nil*; passive motion was resisted by marked muscular spasm and produced great pain. The limb was two inches shorter than its fellow.

Operated May 12, 1898. A lateral incision about five inches long was made over the seat of the fracture. Fragments of the bone were found to be united by firm fibrous union in the overlapped position shown in the photograph. Bones were separated; a transverse section of the ends was made. It required considerable force to extend the leg to obtain an approximation of the fragments, the result of muscular contraction of three months' standing. Silver wire was used to hold bones in position. Wound closed with cat-gut suture; no drainage. Antiseptic dressing applied and limb put up in a plaster-of-Paris spica extending from foot to the nipples. Temperature reached the highest point, $100\frac{1}{2}^{\circ}$, afternoon after the operation; it dropped to normal on third day, where it remained. Patient had considerable pain during first two days caused by the stretching of the muscles; it was relieved by moderate doses of morphine. Plaster-of-Paris removed at end of six weeks; primary union perfect; bone firmly united. The following day the patient was allowed up and around on crutches, which were used for about four weeks, when one crutch only was used for two weeks. Twelve weeks after day of operation patient was able to walk with almost perfect gait, without support. Final measurements made the last time I saw the patient revealed the fact that limb was less than 2-8 of an inch short. At present the patient is walking to school one-half mile from his home.

CASE II. [Plates III.-VI.] Age 22 years. Sustained fracture of both bones of right leg February 2, 1898. Came under my care April 28th. Operation on April 28, 1898. An-

terior incision about five inches long made parallel to crest of tibia and about $\frac{1}{2}$ inch to outer side. Space between ends of bones filled with dense fibrous tissue. Transverse section of ends of tibia made and when approximated were held by a drill left in projecting through the dressing. The fracture of the fibula being an oblique one, the edges were freshened and held together by a kangaroo-tendon suture. Wound was closed without drainage; antiseptic dressings applied and plaster-of-Paris case put on extending from the toes to middle of the thigh. At end of three weeks the drill was removed and wound inspected, when primary union was found to be perfect. Six weeks after the operation the plaster-of-Paris case was removed, and another extending from just below the knee to the ankle was put on and patient allowed up on crutches. Solid bony union was delayed in this case, it being about four months after the operation before the crutches could be discarded. This was due to the patient's general condition being very poor. October 28, 1898, photograph [Plate VI.] was taken which shows good, solid, bony union. Patient walks well unaided, leg about three-eighths of an inch short.

In both of these cases it should be noted that the plaster of Paris was extended well beyond the joints, above and below the seat of the fracture, which produced complete immobilization of the entire limb. This is an excellent safeguard to prevent any danger of the fragments of bone becoming displaced, and at the same time adds very much to the comfort of the patient, by putting at perfect rest the muscles of the injured limb, and thereby preventing painful spasm of the muscles.

CASE III. [Plates VII. and VIII.] Age 9 years. Fracture of right humerus one inch above elbow, March 4, 1898. On day of the accident forcible manipulation at reduction of the fracture was made and arm put up in a plaster-of-Paris splint. On the thirteenth day after injury X-ray photograph taken through the plaster-of-Paris dressing, showing that no reduction of the fragments had been accomplished.

March 25th, three weeks after the accident, Dr. W. T. Bull, of New York, operated on the case, and to him I am indebted for the privilege of reporting the case and also for the following notes regarding the technic of the operation.

Through an open incision on posterior aspect of the elbow, the position of fragments as shown in Plate VII, was found to exist. The lower fragment was tilted inward and upward and so situated as to prevent normal flexion of forearm on arm; fragments were sharp pointed. There were very dense adhesions which glued everything together, although there was motion between the ends of the fragments which were pried apart and traction made upon the elbow to reduce the deformity, but with no success. The ragged and pointed edges were cut square and holes drilled through. After the fragments were approximated they were held in position with kangaroo-tendon sutures. Wound closed except at lower end, where a piece of drainage gauze was left in. After the application of an aseptic dressing, arm was put in a plaster-of-Paris case with forearm slightly flexed. Very little reaction followed; gauze removed on third day and repacked for forty-eight hours longer; this was gradually removed. With exception of a small, discharging sinus for a few weeks, the recovery was uneventful.

The second photograph [Plate VIII.] of this case taken two months after the operation give side and front views of the elbow and show the articulating surface to be in perfect position.

This case has recently been examined by the writer, that is to say seven months after the operation. The motions of the elbow are practically perfect. Extension may possibly be limited by three or four degrees.

In closing this report I wish to thank my friends, Dr. T. Ritchie Stone and Mr. W. H. Merrill, for the excellent X-ray photographs illustrating this article, which were taken at the Lionel Laboratory, Emergency Hospital, Washington, D. C.

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PLATE I. CASE I. Fracture of femur at junction of upper and middle thirds.



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PLATE II.—CASE I. Six weeks after operation.



PLATE III.—CASE II. Fracture of right tibia and fibula. Antero-posterior view.



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PLATE IV.—CASE II. One-half anterior and external view.



PLATE V.—CASE II. Six weeks after operation.

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PLATE VI CASE II, Six months after operation.



PLATE VII.—CASE III. Fracture of right humerus one inch above elbow. Thirteen days after the fracture. Skiograph taken through the plaster-of-Paris dressing



PLATE VIII.—CASE III. Side and front views, two months after operation.

